

Application/Control Number: 10/606,557

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1. (Currently Amended) A magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion, the magnetic memory element being a magnetoresistive element including a pinned layer, a free layer, and a nonmagnetic layer between the pinned layer and the free layer;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;

a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line.

2. (Original) The magnetic random access memory cell of claim 1 wherein the angle is ninety degrees.

3. (Currently Amended) ~~The magnetic random access memory cell of claim 1 further comprising:~~ A magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;

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a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line; and

a selection device residing below magnetic memory element and the electrically connected to the top portion of the magnetic memory element.

4. (Original) The magnetic random access memory cell of claim 3 wherein the magnetic memory element is a magnetic tunneling junction device including a free layer having a changeable magnetic vector, a pinned layer having a fixed magnetic vector, and a thin insulating tunneling layer between the free layer and the pinned layer.

5. (Previously Presented) The magnetic random access memory cell of claim 4 wherein the pinned layer with the fixed magnetic vector is located on top of the thin insulating tunneling layer.

6. (Previously Presented) The magnetic random access memory cell of claim 4 wherein the pinned layer is located beneath the thin insulating tunneling layer.

7. (Original) The magnetic random access memory cell of claim 6 wherein the pinned layer has substantially the same lateral shape as the first write line.

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8. (Currently Amended) ~~The magnetic random access memory cell of claim 1~~ A magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;

a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line, wherein the second write line further includes a central portion and an edge region, the edge region including not facing the magnetic memory element, the edge region including a ferromagnetic cladding layer, thereby concentrating a magnetic field proximate to the magnetic memory element.

9. (Original) The magnetic random access memory cell of claim 8 wherein the ferromagnetic cladding layer is electrically isolated from the central portion of the second write line.

10. (Currently Amended) ~~The magnetic random access memory cell of claim 1~~ wherein a magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element, the first write line including a core including a soft magnetic material;

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a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line.

11. (Previously Presented) A magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element and including a soft magnetic material;

a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line;

wherein the first write line is magnetostatically coupled to the magnetic memory element.

12. (Previously Presented) A magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;

a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line;

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wherein the first write line is a multilayer structure including at least one nonmagnetic layer and at least one soft magnetic layer adjacent to the at least one nonmagnetic layer.

13. (Original) The magnetic random access memory cell of claim 12 wherein the at least one soft magnetic layer includes a plurality of soft magnetic layers and wherein the at least one nonmagnetic layer includes a plurality of nonmagnetic layers, and wherein each of the plurality of soft magnetic layers is alternated with each of the plurality of nonmagnetic layers.

14. (Previously Presented) A magnetic random access memory cell comprising:

- a magnetic memory element having a top portion and a bottom portion;
- a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;
- a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line;
- a selection device residing below magnetic memory element and the electrically connected to the top portion of the magnetic memory element; and
- a conductive stud having a lateral geometry, the stud for electrically connecting the magnetic element and the selection device and residing between the magnetic memory element and the selection device; and

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wherein the magnetic memory element is formed within a region delineated by the lateral geometry of the stud.

15. (Previously Presented) A magnetic random access memory cell comprising:
a magnetic memory element having a top portion and a bottom portion;
a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;
a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line;
a selection device residing below magnetic memory element and the electrically connected to the top portion of the magnetic memory element; and
a conductive stud having a lateral geometry, the stud for electrically connecting the magnetic element and the selection device and residing between the magnetic memory element and the selection device; and
wherein the magnetic memory element is formed outside a region delineated by the lateral geometry of the stud.

16. (Previously Presented) A magnetic random access memory cell comprising:
a magnetic memory element having a top portion and a bottom portion;

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a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element;

a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line;

a selection device residing below magnetic memory element and the electrically connected to the top portion of the magnetic memory element; and

a conductive stud having a lateral geometry, the stud for electrically connecting the magnetic element and the selection device and residing between the magnetic memory element and the selection device; and

wherein the magnetic memory element is formed partially within a region delineated by the lateral geometry of the stud.

17. (Previously Presented) A magnetic random access memory cell comprising:

a magnetic memory element having a top portion and a bottom portion;

a first write line below the magnetic memory element, the first write line being electrically connected with the bottom portion of the magnetic memory element; and

a second write line above the magnetic memory element, the second write line being electrically isolated from the magnetic memory element and oriented at an angle to the first write line;

wherein the first write line includes at least one layer of ferromagnetic material; and

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wherein the magnetic element is a magnetic tunneling junction device including a pinned layer, a portion of the at least one layer of the first write line functioning as the pinned layer.

18. (Currently Amended) A magnetic random access memory comprising:

a plurality of magnetic memory elements, each of the plurality of magnetic memory elements having a top portion and a bottom portion, each of the plurality of magnetic memory elements being a magnetoresistive element including a pinned layer, a free layer, and a nonmagnetic layer between the pinned layer and the free layer;

a first plurality of write lines below the plurality of magnetic memory elements, a write line of the first plurality of write lines being electrically connected with the bottom portion of a corresponding magnetic memory element of the plurality of magnetic memory elements;

a second plurality of write lines above the plurality of magnetic memory elements, the second plurality of write lines being electrically isolated from the plurality of magnetic memory elements, the second plurality of write lines being oriented at an angle to the first plurality of write lines, the plurality of magnetic memory elements residing at intersections between the first plurality of write lines and the second plurality of magnetic write lines.